

REMARKS

This response is intended as a complete response to the Office Action dated October 10, 2007. In view of the following discussion, the Applicants believe that all claims are in allowable form.

CLAIM REJECTIONS

A. 35 USC §103 Claims 1, 3, 4, 6, 7, 9, 10, 12-15 and 17-20

Claims 1, 3, 4, 6, 7, 9, 10, 12-15 and 17-20 stand rejected under 35 USC. §103(a) as being unpatentable over *Nishiyama* in view of Japanese Patent Application Publication No 06-243992, published September 2, 1994 to *Deguchi, et al.* (hereinafter *Deguchi*). The Applicants respectfully disagree.

Independent claims 1, 9, 10, and 19 each recite limitations not taught or suggested by any permissible combination of *Nishiyama* and *Deguchi*.

Nishiyama generally teaches a method for forming an insulation layer using a plasma enhanced chemical vapor deposition apparatus. (See, *Nishiyama*, English Machine Translation (EMT), pg. 1, ¶ [0001].) With respect to the apparatus, *Nishiyama* discloses a counterelectrode 15 that is equipped with RF generators 16 and 17 of two variable frequencies through two independent matching networks 18 and 19, respectively. (*Id.* at ¶ [0012].) However, *Nishiyama* fails to teach or suggest, an apparatus for matching the impedance of a pair of RF sources wherein a first match tune space defined by a first sub-circuit can be varied without affecting a second match tune space defined by a second sub-circuit, as recited in claims 1, 9, 10, and 19.

The Examiner admits that *Nishiyama* does not expressly teach the claimed features of the first and second matching sub-circuits with respect to claims 1, 9, 10, and 20, and asserts that it would have been obvious to modify *Nishiyama* with the teachings of *Deguchi* in a manner that would yield the limitations recited in the presently rejected claims. (Office Action, p. 4.) The Applicants respectfully disagree.

Deguchi teaches a plasma processing device having a matching part 14 and an RF electric power supply part 12 in which the impedance is matched by changing an oscillation frequency of output electric power on the side of the RF electric power supply part 12. *Deguchi*, however, discloses only one RF signal for one matching part and is devoid of any teaching or suggestion regarding the matching of multiple RF signals fed to a single electrode. Specifically, *Deguchi* fails to teach or suggest an apparatus for matching the impedance of a pair of RF sources coupled to a single electrode to the impedance of a plasma in a semiconductor substrate processing chamber wherein a first match tune space defined by the first sub-circuit can be varied without affecting a second match tune space defined by the second sub-circuit, as recited in independent claims 1, 9, 10, and 19.

Therefore, *Deguchi* fails to teach or suggest a modification of *Nishiyama* that would yield an apparatus for matching the impedance of a pair of RF sources wherein a first match tune space defined by a first sub-circuit can be varied without affecting a second match tune space defined by a second sub-circuit, as recited in claims 1, 9, 10, and 19. Thus, a *prima facie* case of obviousness has not been established as the combination of the cited art fails to yield the limitations recited in the claims.

The Examiner asserts that the apparatus taught by the combination of *Nishiyama* and *Deguchi* meets "all of the structural limitations of the claimed invention" and "would be structurally capable of performing the intended use of allowing the first match tune space defined by the first sub-circuit to be varied without substantially affecting the second match tune space defined by the second sub-circuit, by varying the shunt capacitors." (*Office Action*, p. 5.) The Applicants respectfully disagree.

Specifically, the Applicants note that it is well settled law that structural elements may be defined functionally. "A patent applicant is free to recite features of an apparatus either structurally or functionally." (*In re Schreiber*, 128 F.3d 1473, 44 USPQ 2d 1429 (Fed. Cir. 1997).) "[T]here is nothing intrinsically wrong with [defining something by what it does rather than what it is] in drafting

patent claims." (*In re Swinehart*, 439 F.2d 210, 212, 169 USPQ 226, 228 (CCPA 1971).) "[W]hile the claims contain numerous functional statements, these statements seem to be for the purpose of clearly defining or differentiating elements which have been positively included in the claims. We see no objection to the use of functional statements to define an element..." *In re Sherman*, 45 USPQ 532, 534 (Pat. Off. App. 1939).)

Here, as noted above as held by the courts to be permissible, any functional statements present in the independent claims are "for the purpose of clearly defining or differentiating elements which have been positively included in the claims" (e.g., the first and second sub-circuits). These "functional" limitations impose a structural difference between the present claims and the combination of cited art asserted by the Examiner. Specifically, the first sub-circuit must have a structure that allows a first match tune space defined by the first sub-circuit to be varied without affecting a second match tune space defined by the second sub-circuit. This structure is neither taught nor suggested by the cited art.

The Examiner asserts that the combination of *Nishiyama* and *Deguchi* would be able to meet this limitation. However, the Examiner has not cited any art or referred to any knowledge available to one of ordinary skill in the art at the time the invention was made that evidences such an ability of the asserted combination. The Examiner refers to paragraphs 20 and 21 of the present application to provide the only reasoning for her assertion. (*Office Action*, p. 5.) However, the Applicants note that the present application merely provides an example of some of the deficiencies of the prior art in addition to the operation of the claimed invention and does not refer to the operation of some imaginary apparatus that might be resultant from the combination the teachings of certain prior art references. As such, the Applicants' own teachings with respect to the operation of the presently claimed invention does not show how the combination of *Nishiyama* and *Deguchi* may operate.

In the Response to Arguments section of the Office Action, the Examiner states that because *Nishiyama* teaches variable frequency RF sources that it "...follows that *Nishiyama* et al. teaches first and second sub-circuits that are

capable of matching the impedances of RF signals having frequencies within the claimed ranges.” (Office Action, pp. 11-12.) However, the Applicants note that, even if this were true, such an ability still fails to teach or suggest an apparatus for matching the impedance of a pair of RF sources wherein a first match tune space defined by a first sub-circuit can be varied without affecting a second match tune space defined by a second sub-circuit, as recited in claims 1, 9, 10, and 19.

As such, the combination of *Nishiyama* and *Deguchi* still fails to teach or suggest an apparatus for matching the impedance of a pair of RF sources wherein a first match tune space defined by a first sub-circuit can be varied without affecting a second match tune space defined by a second sub-circuit, as recited in claims 1, 9, 10, and 19. Therefore, a *prima facie* case of obviousness has not been established as the combination of the references fails to yield the limitations recited in the claims.

Moreover, while the Applicants maintain that it remains the Examiners’ burden to establish a *prima facie* case of obviousness, the Applicants have attempted to expedite prosecution by filing a Declaration of inventor Steven C. Shannon under 37 C.F.R. §1.132 in connection with the prior Response filed September 16, 2007. In this Declaration, the Applicants have shown that fixed series elements in the respective tuning portions of a dual frequency match circuit will not necessarily provide respective tune space independence. As such, merely providing the match circuits of *Nishiyama* with fixed series components and a variable shunt to ground will not necessarily result in a dual frequency match circuit having tune space independence for the respective tuning circuits for each frequency signal. Moreover, the Declaration further provides an example to further show a configuration of a dual frequency match circuit having fixed series elements and a variable shunt to ground that does not yield the limitations recited in independent claims 1, 9, 10, and 19 – that a first match tune space defined by the first sub-circuit can be varied without affecting a second match tune space defined by the second sub-circuit.

In the Response to Amendments section of the Office Action, the Examiner states that the above-referenced Declaration is insufficient to overcome the present rejections because, 1) there is no showing that the objective evidence of non-obviousness is commensurate with the scope of the claims; 2) the comparison of the claimed subject matter is not with the closest prior art; and 3) the Declaration does not show why the combination of cited art is not structurally capable of meeting the limitations recited in the claims. (*Office Action*, pp. 8-11.) The Applicants strongly disagree for the following reasons.

The Applicants note that the purpose of the Declaration is to show that a *prima facie* case of obviousness has not been established in the first instance – that, contrary to the Examiner’s contention with respect to the capability of the combined apparatus of *Nishiyama* and *Deguchi*, match circuits for coupling two frequencies to a common electrode and having at least one fixed set of series components and at least one variable shunt component connected to ground may be designed that do not provide a first match tune space that can be varied without affecting a second match tune space. Thus, the Examiner cannot merely assume that the combination of *Nishiyama* and *Deguchi* will meet the limitations of the claims.

As such, the Declaration is not intended to show why the combination of *Nishiyama* and *Deguchi* are not structurally capable of meeting the limitations recited in the claims. In fact, such a showing would be impossible due to the lack of teaching of any particular structure and design of the individual match circuits of the references. This furthers the showing that the combination of the cited art fails to teach or suggest or otherwise yield the limitations recited in the claims.

Moreover, the Applicants respectfully submit that the Examiner has misinterpreted the comparison provided in the Declaration. Specifically, the Examiner states that the declaration compares the claimed subject matter with a “proprietary Applied Materials, Inc. parallel lump element match circuit” rather than the closest prior art, making it impossible to determine whether the demonstration of a dual frequency match circuit that does not have respective

tune space independence is relevant to the grounds set forth in the Office Actions. (Office Action, p. 10.)

However, the Applicants note that the comparison provided in the Declaration is not between the claimed subject matter and “a proprietary Applied Materials, Inc. parallel lump element match circuit.” As stated in the Declaration in paragraph 10, the comparison provided in the Declaration is between the claimed subject matter and a dual frequency match circuit having fixed series components and a variable shunt to ground (the resultant combination of *Nishiyama* and *Deguchi* alleged by the Examiner). This comparison is illustrated in the Smith chart by being modeled using a proprietary Applied Materials, Inc. parallel lump element match circuit analysis performed in the MathCAD software package. The proprietary nature of the match circuit analysis and other information provided in the Declaration do not make it impossible to determine the relevancy of the Declaration to the grounds of rejection in the Office Action.

To the contrary, the Applicants submit that the Declaration is directed to a specific assumption made and relied upon by the Examiner to support the rejections of each of the independent claims in the present application – that the combination of *Nishiyama* and *Deguchi* would be structurally capable of providing an apparatus for matching the impedance of a pair of RF sources wherein a first match tune space defined by a first sub-circuit can be varied without affecting a second match tune space defined by a second sub-circuit, as recited in claims 1, 9, 10, and 19.

Thus, the Applicants submit that the Declaration is both relevant and sufficient to show that the combination of *Nishiyama* and *Deguchi* fail to teach or suggest an apparatus for matching the impedance of a pair of RF sources wherein a first match tune space defined by a first sub-circuit can be varied without affecting a second match tune space defined by a second sub-circuit.

For the reasons discussed above, the Applicants submit that the discussion provided above, alone or in combination with the Declaration, show that the combination of *Nishiyama* and *Deguchi* fails to teach or suggest an apparatus for matching the impedance of a pair of RF sources wherein a first

match tune space defined by a first sub-circuit can be varied without affecting a second match tune space defined by a second sub-circuit, as recited in claims 1, 9, 10, and 19. Therefore, a *prima facie* case of obviousness has not been established because the combination of *Nishiyama* and *Deguchi* fails to teach or suggest the limitations recited in independent claims 1, 9, 10, and 19.

Thus, claims 1, 9, 10, and 19, and all claims depending therefrom, are patentable over *Nishiyama* in view of *Deguchi*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

C. 35 USC §103 Claim 5

Claim 5 stands rejected under 35 USC §103(a) as being unpatentable over *Nishiyama* in view of *Deguchi* as applied to Claim 1 above, and further in view of US Patent No. 6,887,339, issued May 3, 2005, to *Goodman, et al.* (hereinafter *Goodman*). The Applicants respectfully disagree.

Independent claim 1, from which the above rejected claim depends, recites limitations not taught or suggested by any combination of the cited references. The patentability of claim 1 over the combination of *Nishiyama* and *Deguchi* has been discussed above.

The Examiner cites *Goodman* to show that RF sources conventionally have a 50 Ohm output impedance. *Goodman*, however, individually or in any permissible combination with *Nishiyama* and *Deguchi* does not teach or suggest a first sub-circuit for matching the impedance of a first variable frequency RF signal generated by a first RF source to the impedance of the plasma and a second sub-circuit for matching the impedance of a second variable frequency RF signal generated by a second RF source to the impedance of the plasma... wherein the first and second sub-circuits each further comprise at least one fixed set of series components and at least one variable shunt component connected to ground, and wherein a first match tune space defined by the first sub-circuit can be varied without affecting a second match tune space defined by the second sub-circuit. Accordingly, the teachings of *Goodman* cannot be used to modify the teachings of *Nishiyama* and *Deguchi* in a manner that yields the

limitations as recited in claim 1. Therefore, a *prima facie* case of obviousness has not been established because the combination of *Nishiyama*, *Deguchi*, and *Goodman* fails to teach or suggest the limitations recited in claim 1.

Thus, claim 5 is patentable over *Nishiyama* in view of *Deguchi*, and further in view of *Goodman*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claim allowed.

D. 35 USC §103 Claims 8 and 16

Claims 8 and 16 stands rejected under 35 USC §103(a) as being unpatentable over *Nishiyama* in view of *Deguchi* as applied to Claim 1 and 10 above, and further in view of US Patent No. 6,641,149, issued November 4, 2003, to *Suemasa, et al.* (hereinafter *Suemasa*). The Applicants respectfully disagree.

Independent claims 1 and 10, from which the above rejected claims respectively depend, recite limitations not taught or suggested by any combination of the cited references. The patentability of claims 1 and 10 over *Nishiyama* and *Deguchi* has been discussed above.

Suemasa teaches a plasma processing method including a process chamber having two RF power sources 122, 128, coupled through two matching devices 120, 126, to a lower electrode 106. (See, *Suemasa* Fig. 1 and accompanying text.) *Suemasa*, however, individually or in any permissible combination with *Nishiyama* and *Deguchi* fails to teach or suggest a first sub-circuit for matching the impedance of a first variable frequency RF signal generated by a first RF source to the impedance of the plasma and a second sub-circuit for matching the impedance of a second variable frequency RF signal generated by a second RF source to the impedance of the plasma... wherein the first and second sub-circuits each further comprise at least one fixed set of series components and at least one variable shunt component connected to ground, and wherein a first match tune space defined by the first sub-circuit can be varied without affecting a second match tune space defined by the second sub-circuit. Accordingly, the teachings of *Suemasa* cannot be used to modify the teachings

of *Nishiyama* and *Deguchi* in a manner that yields the limitations as recited in claims 1 and 10. Therefore, a *prima facie* case of obviousness has not been established because the combination of *Nishiyama*, *Deguchi* and *Suemasa* fails to teach or suggest the limitations recited in claims 1 and 10.

Thus, claims 8 and 16 are patentable over *Nishiyama* in view of *Deguchi*, and further in view of *Suemasa*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

NEW CLAIM

The Applicants have added new claim 21 to the application. The Applicants submit that claim 21 is patentable over the cited art for reasons similar to those discussed above.

Specifically, the Applicants submit that not combination of the cited art teaches or suggests an apparatus for matching the impedance of a pair of RF sources coupled to a single electrode to the impedance of a plasma in a semiconductor substrate processing chamber including a first sub-circuit for matching the impedance of a first RF signal generated by a first RF source to the impedance of the plasma; and a second sub-circuit for matching the impedance of a second RF signal generated by a second RF source to the impedance of the plasma, the second sub-circuit connected to the first sub-circuit to form a common output that is coupled to the electrode; wherein the first and second sub-circuits are each adapted to vary a respective match tune space defined by the respective sub-circuit without affecting another respective match tune space defined by the other sub-circuit, as recited in claim 21.

Thus, the Applicants respectfully request allowance of this claim.

CONCLUSION

Thus, the Applicants submit that all claims now pending are in condition for allowance. Accordingly, both further consideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that any unresolved issues still exist, it is requested that the Examiner telephone Alan Taboada at (732) 935-7100 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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